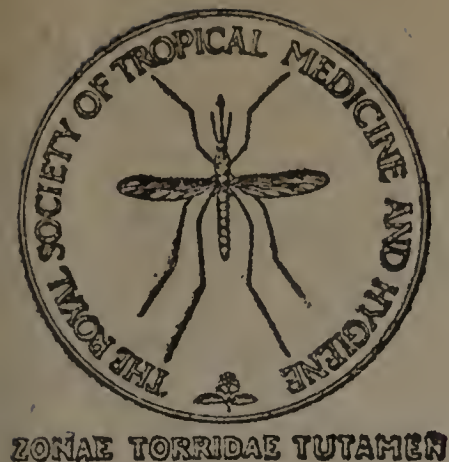


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WITH THE WELLS - COMPLIMENT

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THE FIRST RECOGNIZED EPIDEMIC OF YELLOW FEVER.

BY

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Wellcome Bureau of Scientific Research, London.

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The first recognized account of yellow fever is that given by Père JEAN BAPTISTE DU TERTRE (1667-1671) of the outbreak which he himself witnessed in the Island of Guadeloupe in 1648. A few months later, DIEGO LÓPEZ DE COGULLUDO (1688) described an epidemic with similar characteristics in Yucatan. Since CARTER (1931) published his epidemiological and historical study of the place of origin of yellow fever, much has been learnt not only of the nature of the disease but of the circumstances attending the outbreak of yellow fever in 1648. These observations are in favour of the view that infection was brought to the West Indies from the West Coast of Africa, either to Barbados or less probably to St. Christopher, whence it spread to Yucatan and to Havana. Before discussing the evidence on which this conjecture is based, it is necessary to retail briefly the accounts, now well known, of the outbreaks in Guadeloupe and Yucatan.

THE OUTBREAK IN GUADELOUPE.

The islands of Guadeloupe and Martinique had been colonized by the French in June and July, 1635, respectively. Food for only 2 months was brought by the original colonists from Dieppe and, as a result, conditions soon became difficult, more especially as the natives with whom the colonists quarrelled fled and refused to supply food. DU TERTRE, who arrived in Guadeloupe in 1640, wrote two works on the history of the Caribbean: (I) "Histoire generale des isles des Christophe, de la Guadeloupe, de la Martinique et autres dans l'Amerique, 1654," and (II) "Histoire generale des Antilles habitées par les François, 1667-1671." The early history of Guadeloupe is described in both books. The famine which began 2 months after the arrival of the colonists caused them, for lack of potatoes or manioc, to live on grass and fresh tortoise meat. This diet, probably as a result of vitamin deficiency, caused acute dysentery and death ("flux de ventre et de sang qui en firent mourir plusieurs"). The famine went on for five years, till 1640, and was followed by an almost general mortality to which, beside the famine, two things especially contributed. The first was a certain disease commonly called in the islands the coup de barre, characterized by a very severe headache, associated with violent pulsations in the arteries of the temples and great difficulty in breathing, with lassitude and pain in the thighs as if one had been

struck with blows by a bar. The disease attacked especially those who were digging. The cruelty of the overseers was the other cause of death, not only of "ces pauvres engagez," but of the gentlemen of the Company and the merchants of Dieppe, for the colonists were forced by blows and by severity to work in clearing the woods and in all weathers. The French, in fact, were treated worse than slaves in Barbary. The colony at Martinique had no famine and no disease.

Although the term "coup de barre" was often applied later to one of the symptoms of yellow fever, the malady described by DU TERTRE as present in Guadeloupe in 1640 suggests either dengue or more probably beriberi resulting from food deficiency. BRETON (1665) also noted and described the "coup de barre" of Guadeloupe in his Carib-French dictionary, but since his work was published after DU TERTRE's first book, it is not quite correct, as CARTER (1931) suggests, to assert that the latter borrows entirely from BRETON. No other event of medical importance in Guadeloupe is mentioned by DU TERTRE till 1648, "During this same year, 1648, the plague (la peste), hitherto unknown in the islands since they were inhabited by the French, was brought thither by certain ships." It began in St. Christopher, and in the 18 months that it lasted there it carried off nearly one-third of the inhabitants. A ship, "Le Boeuf," of Rochelle, carried it from St. Christopher to Guadeloupe, the sailors and passengers being sick and dying on board her. When the boat arrived at Basseterre, Père ARMANDE DE LA PAIX, the Superior of the Jesuit Mission, went aboard "to confess and serve the sick and dying." The Father contracted the disease and died on St. Dominic's Day, 4th August. The disease was contagious in Guadeloupe and lasted 20 months. The symptoms were violent pain in the head, general weakness in all the limbs, "and continual vomiting so that in three days it would send a man to his grave." No actual mention is made of "black vomit."

THE OUTBREAK IN BARBADOS.

There is thus clear evidence that an infectious disease was carried from St. Christopher to Guadeloupe in July, 1648. Unfortunately, there is no clear description of the disease in St. Christopher apart from the fact that it was similar to the epidemic occurring in Barbados.

The two chief accounts of the Barbados outbreak are given by RICHARD LIGON (1657), who was an actual observer, and by JOHN SCOTT (1634-1696), whose account was derived from eye-witnesses. LIGON left São Thomé on 10th August with slaves for Bridgetown. On arrival, the town seemed very prosperous. "Yet notwithstanding all this appearance of trade, the Inhabitants of the Ilands and shipping too (there were twenty-two good ships in harbour) were so grievously visited with the plague (or as killing a disease) that before a month was expired after our Arivall, the living were hardly able to bury the dead. Whether it were brought thither in shipping: (for in long voyages,

diseases grow at sea and take away many passengers, and those diseases prove contagious), or by the distempers of the people of the Iland: who by the ill dyet they keep and drinking strong waters, bring diseases upon themselves, was not certainly known. But I have this reason to believe the latter; because for one woman that dyed there were ten men and the men were the greater deboystes. In this sad time we arriv'd in this Iland; and it was a doubt whether this disease or famine threatned most; there being a generall scarcity of victuals throughout the whole Iland." LIGON had proposed to go on to Antigua, "where we intended to plant: but the ships being (for the most part) infected with this disease we were compelled to stay longer." At the time of their arrival at Bridgetown and a month or two after "the sickness rained so extremely that the dead carcasses were thrown into the bog, whereby the water was infected." SCOTT (1667) adds but few details: he, too, noted that men were more frequently attacked than women, "as is usual with epidemics, showing a favour to that sex."

Although LIGON and SCOTT constitute the two most important authorities for the outbreak in Barbados, there are numerous other contemporary references to the epidemic which is shown to affect both Barbados and St. Christopher. JOHN WINTHROP (1853), the Governor of Massachusetts, left manuscript notes for a history of New England from 1630 to 1649. Incidentally, WINTHROP was a man of scientific interests and was the first to import chemical apparatus into North America (CHILD, 1940). Under the year 1647 he wrote, "An epidemical sickness was through the country (New England) among Indians and English, French and Dutch. It took them like a cold and a light fever with it. Such as bled or used cooling drinks died; those who took comfortable things, for the most part recovered and that in few days. Wherein a special providence of God appeared, for not a family nor but few persons escaping it, had it brought all so weak as it did some, and continued so long, our hay and corn had been lost for want of help; but such was the mercy of God to His people, as few died, not above forty or fifty in Massachusetts and near as many at Connecticut." Mrs. Winthrop, aged 56, however, was one of those who died. This outbreak, which occurred in the summer, was probably influenza and was quite distinct from the Caribbean epidemic. This point must be insisted upon since HUTCHINSON (1764), WEBSTER (1804) and others completely confuse the two.

Later WINTHROP continues, referring to the winter months. "It pleased the Lord to open to us a trade with Barbados and other Islands in the West Indies, which as it proved gainful, so the commodities we had in exchange there for our cattle and provisions as sugar, cotton, tobacco and indigo were a good help to discharge our engagements in England. And this summer there was so great a drouth as their potatoes and corn, etc., were burnt up; and divers London ships which rode there were so short of provisions as, if our vessels had not supplied them, they could not have returned home. . . . After the

great dearth of victuals in these islands followed presently a great mortality (whether it were the plague or pestilent fever, it killed in three days) that in Barbados there died six thousand and in Christophers of French and English, near as many and in other islands proportionable. The report of this coming to us, by a vessel which came from Fayal, the court published an order that all vessels which should come from the West Indies should stay at the castle and not come on shore, nor put any goods on shore, without license of three of the council, on pain of one hundred pounds, nor any to go aboard, etc., except they continued there, etc., on like penalty. The like order was sent to Salem and other haven towns." The order is of considerable interest since it represents the first instance in which quarantine regulations were applied in the New World. The reasons for promulgating the order (cf. Records of the Governor and Company of the Massachusetts Bay, 1853) were stated to be "For as much as this Court is credibly informed yt ye plague or like greivous infectious disease, hath lately exceedgly raged in ye Barbadoes, Christophers and other islands in ye West Indies, to ye great depopulatg of those, it is therefore ordred, yt all our own or othr vessels comeing from any pts of ye West Indies to Boston harbor shall stop and come to an anchor before they come at ye Castle" It was nearly two years, that is to say in the autumn of 1649, before the order was repealed. "The Court doth think meete that the order concerning the stoping of West Indie ships at the Castle should hereby be repealed, seeing it hath pleased God to stay the sickness there."

Two letters throw further light on the outbreak. Mr. RICHARD VINES, who had lately removed from New England to Barbados, wrote to Governor WINTHROP, giving him some account of the epidemic. His letter, dated "Barbadoes, April 20, 1648," states "The sickness was an absolute plague, very infectious and destroying insomuch that in our parish there was buried twenty in a week and many weeks together fifteen or sixteen. It first seized on the ablest men, both for account and ability of body. Our New England men here had their share and so had all nations, especially Dutchmen, of whom died a great company, even the wisest of them. The contagion is well nigh over." That this last statement was not correct is shown by a further letter dated "Salem, 17th December, 1648," from LUCY DOWNING, of Boston, to JOHN WINTHROP, Jnr., "My 2 sonns Jo and Robin I bless God are safe returned but Robin in respect of the loss of his master, and Jo in respect to the sad Sickness still at Barbados are both now gone to Boston to see which waye Providence will dispose for them." It is thus clear that an epidemic disease began in Barbados in September, 1647: it was fatal in three days. A similar disease occurred in St. Christopher and thence spread to Guadeloupe in August, 1648. Here also it killed in three days. The epidemic was still present in Barbados in December, 1648, and apparently had not disappeared till the early autumn of 1649 when the quarantine regulations in New England were at last relaxed.

THE OUTBREAK IN YUCATAN.

The outbreaks in Barbados, St. Christopher and Guadeloupe did not, however, represent the full extent of the epidemic, for a very similar disease made its appearance both in Yucatan and in Havana. The epidemic in Yucatan was very fully reported by LÓPEZ DE COGULLUDO (1668): his account has been translated by FINLAY (1912) and by CARTER (1931). The epidemic, the "peste," began in the beginning of June, 1648, in the City of Campeche, on the west coast of the peninsula of Yucatan. In a few days "the disease" so pressed on it that it was totally laid waste. A letter is quoted from a citizen of Campeche, "If God does not pity our misery and soon soften the rigor of His Justice it will be said 'Here was Campeche,' as it was said of Troy. . . . The roads from Campeche were guarded, fearing communication of the contagion . . . With this fear . . . passed the month of July, in the end of which began some people" (in Merida) "to sicken, who died very soon, but it was not recognized to be the 'peste' until the beginning of August. With such quickness and violence it came on great and little, rich and poor, that in less than eight days almost the whole city was sick at one time and many of the citizens of highest name and authority in it died. The city, afflicted with such a misfortune not seen before since this land was conquered by the Spanish nation . . . sought leave to bring in the Holy Image of Our Lady of Izamal. . . . The most part of the Indians of Izamal who attended the Holy Image on the road and in the City of Merida, were attacked by the contagion of the peste in it and a few days after they arrived at Izamal passed from this present life." MOLINA SOLIS (1904-1910) confirms this by stating that "in September all the district of Izamal was infected. The tribulation of the city (Merida) was very great as never had it experienced such a disaster. . . . In the beginning few of the Friars died . . . when the peste was at its height few were sick . . . afterwards many sickened at once. . . . Pestilences are accustomed to be a common accident in other lands, which uniformly attack all, but it was not thus in Yucatan, which was the occasion of the greater confusion. It is not possible to say what was this malady, because the physicians did not recognize it." Of the symptoms "The most common was for the patients to be taken with a very severe and intense pain in the head and of all the bones of the body, so violent that it appeared to dislocate them or to squeeze them as in a press. In a little while after the pain a most vehement fever, which to most occasioned delirium, although to some not. Followed some vomitings as of putrefied blood and of these very few remained alive. To others there was a flow from the bowels of a bilious humour which "being "corrupted caused dysentery which they call 'sin vómitos'. Others were provoked to them "(vomitings) "with great violence but in vain and many suffered the calentura and pain in the bones without other accidents. . . . To the most the fever appeared to remit entirely on the third day; and they said that already they felt no pain; the delirium ceased, conversing sensibly, but they were not able to eat nor to drink anything and thus going on one or more days, speaking and saying

that they were well, they died. There were many who did not pass the third day; the most died beginning the fifth, very few reached the seventh, except those who survived, and of these the most were elderly. It attacked young men, the most robust and healthy with most violence and finished their lives the quickest. . . . Although very many women sickened, the sickness did not bear as hard on them as on men . . . but it was rare that one found a pregnant woman who remained alive. . . . The sickness killed the most robust youths the quickest. . . . The same year of 1648 in which the peste began some pestilential air or other bad influence had dried up all the pines well-grown and large . . . all the new little pines remaining alive, and then I made this reflection that of the children of tender age whom the peste attacked in Yucatan there were very few who died compared with people of more advanced age." At first the only Indians affected were those in close contact with the Spaniards and those who went into the city. Later "in many of their pueblos the same sickness showed as among the Spaniards, making fearful ravages as among a people without resources or medicines. The sickness lasted in the whole land for the space of two years": almost everyone who came into the country during this time sickened but there were no recurrences. "All remained so pallid that they appeared dead: many without hair, with eyelashes dropped out, all so broken that although they had had only two days of fever and a little pain in the bones . . . many could not regain their strength."

The above description is very characteristic of yellow fever except for the failure to mention jaundice. Many similarities will be noted with the diseases occurring in Barbados and Guadeloupe.

THE OUTBREAK IN HAVANA.

The last recorded outbreak at this time was in Havana. Unfortunately, the only authority for the disease in Havana is PEZUELA, who writing nearly 220 years later, is uncertain as to the date of the outbreak he describes. PEZUELA's accounts are in all probability based on the records of VILLALBA the Governor, who, himself, suffered from the disease. In his "Diccionario geográfico, estadístico, histórico de la Isla de Cuba" (Madrid 1863-1866, tom. 3, p. 23), PEZUELA wrote under the year 1648, "Peste of putrid fevers in Havana and in the fleet of Don Juan Pujadas, stationed in the port almost all the summer. Three assessors of government died, namely successively, an alcalde, many functionaries, a third part of the garrison and of civilians in the neighbourhood and an even greater proportional number of the crews and passengers of the vessels." There is nothing chronicled for the year 1649. On the other hand, in the "Historia de la Isla de Cuba," PEZUELA (1868-1878, tom. 2, pp. 106-109) gives no entry for the year 1648 but "in the spring of 1649, supervened to terrify it" (the country) "a horrible epidemic. From that of small-pox which decimated the new born pueblos . . . at the beginning of the sixteenth century,

there had not been known other contagions and sicknesses than those inherent to its warm climate and the malignant fevers of the summer of 1620. The records of Governor Villalba neither detailed nor even explained the symptoms of the sickness which then prevailed in many coastwise settlements of the Continent and which was supposedly introduced into Havana by vessels from Cartagena and Portobello. . . . A third part of its population was devoured from May to October by a species of putrid fever which carried off those attacked in three days. The therapy, tried gropingly by some experimenting physicians . . . against an unknown sickness, aggravated instead of curing it." (CARTER's translation.) VILLALBA, the Governor, fell sick in August, but recovered. The auditor, MOLINA, who was appointed as his temporary successor, died, however, as also did the three licentiates, who successively took his place. As in the previous account, an alcalde and many functionaries, a third part of the garrison and of civilians in the neighbourhood and an even greater number of the crews and passengers of the squadron succumbed. The losses in the garrison were replaced by officers and men from Vera Cruz and Cadiz in 1650 : a fact which suggests that 1649 was the more correct date. In addition, the *Historia* (tom. 2, p. 112) states that the fever in Santiago de Cuba in 1653 was three years after the Havana outbreak, while (p. 107) it is also stated that "this peste of putrid fevers had afflicted Vera Cruz and other pueblos of New Spain the preceding summer," *i.e.*, in 1648, when Campeche was infected.

THE ORIGIN OF THE PANDEMIC.

The five outbreaks which have been described can obviously be divided into two groups, one involving Barbados, St. Christopher and Guadeloupe in the east, the other Yucatan and Cuba in the west. The descriptions of the outbreaks in Guadeloupe and Yucatan leave no doubt that they were yellow fever. According to DU TERTRE, infection was brought to Guadeloupe from St. Christopher: the outbreak in St. Christopher must therefore almost certainly have been due to yellow fever. The epidemics in St. Christopher and Barbados were regarded by contemporary observers such as LIGON and WINTHROP, as part of the same epidemic. It is reasonable, despite the absence of a description of the symptoms, to conclude that the infectious disease in Barbados was also yellow fever. In the same way the outbreak in Yucatan was undoubtedly yellow fever, and since the association of the islands with terra firma was very close, it is not unreasonable to conclude that the highly fatal disease in Cuba was also yellow fever. Owing to tides and winds it would be easy for a ship to convey infection from the Windward Islands to terra firma but difficult in the opposite direction.

In order to obtain light on the genesis of the outbreaks, it is necessary to review very briefly two possibilities: (1) That yellow fever was endemic in the New World; (2) that the disease was introduced from Africa.

The history of Yucatan and Havana before 1648 has been very fully described by CARTER (1931), and only a brief resumé need here be given.

Yucatan. Before the conquest of the Mayas the only reference in their chronicles to an epidemic disease is to the Maya Ciml'al which is supposed to have occurred in 1482 or 1483. No precise details are given of this disease. From the Spanish conquest to 1648 the only pestilence suggestive of yellow fever is that attacking the members of MONTEJO's expedition in 1527, although in the 120 years between 1527 and 1648 there had been an enormous influx of non-immunes from Spain. The only diseases recorded in this period are those well known in Europe, smallpox, measles and tarbardillo (probably typhus).

Havana. The island of Cuba was settled in 1511 by VELASQUEZ with 300 residents from Santo Domingo. From that date till 1648 no epidemic resembling yellow fever is recorded, with the exception of an outbreak in 1620 when an epidemic of pernicious fevers decimated Havana, lasting from June to November, and carrying away many victims both from the town and from the flota (PEZUELA, 1868-1878). CARTER (1931), quoting Dr. BEATO of Havana, shows that this fever did not excite sufficient alarm for rogations or processions. The evidence therefore is in favour of the view that yellow fever was not present in Cuba before 1648 or 1649. After this date it remained in the island till 1655, when it totally disappeared. In the meantime, in July and August of 1653, "the same fevers afflicted Santiago and Bayama as the capital had suffered three years ago, with equal havoc as in Havana" (PEZUELA, Historia, tom. ii, p. 112).

Guadeloupe. The only disease described by BRETON (1665) and DU TERTRE (1654 and 1667) as having occurred in Guadeloupe before 1648 is the coup de barre previously mentioned.

St. Christopher. Captain THOMAS WARNER, in 1620, accompanied ROGER NORTH to Guiana: on the voyage he learnt from a Captain PAINTON of the fertility of St. Christopher. In 1623, with thirteen others, he sailed for St. Christopher, landing there on 28th January, 1624. Caribs were then present in the island, while a year later French colonists arrived under D'ESNAMBUC and DU ROSSEY, who had procured from Cardinal RICHELIEU the privilege of establishing plantations in St. Christopher and Barbados. Apart from deficiencies of food on the voyages out—DU ROSSEY on the "Cardinal" had only sixteen out of seventy persons alive when he arrived at Pointe de Sable—the colonists thrived, though in 1629 both the French and English were temporarily driven out by an attack of the Spanish. Until 1647, however, there is no history of epidemic disease. Apart from the references to the epidemic in that year given in association with the Barbados outbreak there is no eyewitness account, but Père PELLEPRAT (1655) refers to an epidemic sickness in the island in 1652-3 which was communicable, fatal and general: this disease was associated with a shortage of food. Whether or not this infectious condition was the aftermath of the epidemic of 1647-1648 is uncertain.

Barbados. In 1625, JOHN POWELL the elder arrived in the "Olive," and took possession of the uninhabited island: eighty colonists landed in 1627 and by

1629 between 1,600 and 1,800 persons had arrived. Yams, cassava, Indian corn and plantains were obtained from Guiana, and for a time all went well. Sir HENRY COLT (1631), the first English tourist to visit the West Indies, has left a full account of the island in its early years. He was struck by the absence of disease but found the "aboundance of smale knatts by ye sea shore towards ye sunn goinge down" rather annoying. On the other hand, "noe body lice will increase beyond ye Tropick but head lice will, and ye Itch and scratchinge cannot be avoyded." The drunken habits of the colonists and their laziness, however, were the cause of their lack of food whenever for any cause their crops failed. The years 1630-1631 were, in fact, known as "the starving time," and whenever climatic conditions were unfavourable or communications with England failed the colonists were faced with want. The same conditions continued throughout the seventeenth century. For example, in May, 1666, FRANCIS LORD WILLOUGHBY wrote to KING CHARLES II, warning him that "Barbados and ye rest of ye Caribee Islands belonging to yor Majesty have not clothes sufficient to hide their nakedness, nor food to fill their bellies." In 1673 "there is great want of Provisions on the Island," and, in 1674, "We have continued here in great peace and health but by reason of the Interruption of Trade by the present warr in greate want of all things but especially provisions." Apart from this lack of food there was no history of an epidemic outbreak in Barbados before 1647 or for some years after.

THE WEST INDIES AND AFRICA.

The evidence thus shows that yellow fever was not endemic in any of the areas where it appeared in epidemic form in 1647-1649. If the disease was not endemic in the Caribbean region it must have been introduced from outside. There is considerable evidence to show that this area was West Africa. This view is not new, for CHARLES DE ROCHEFORT, writing in 1658, has the following suggestive statement, "The air of all these islands (the Caribbean) is quite temperate and remarkably healthy when one has become accustomed to it. The plague was formerly unknown there, just as in China and some other parts of the East. But some years ago the greater part of these islands were afflicted with malignant fevers that the doctors held to be contagious. This bad air had been carried by ships which came from the coast of Africa. But to-day one no longer hears such diseases spoken of."

If, as DE ROCHEFORT suggests, a contagious and malignant fever had been brought from Africa but had later disappeared, were there any circumstances which would favour the transmission of yellow fever from West Africa to Barbados and St. Christopher? In order to consider this question it is necessary to review very briefly the economic history of these islands. When first colonized the principal crop grown for export was tobacco. The population of Barbados increased rapidly from 6,000 in 1636 to, according to

one authority, 37,200 in 1643 : " At the beginning, all the foreign Inhabitants of the Caribbees apply'd themselves wholly to the culture of Tobacco, whereby they made a shift to get a competent livelihood, but afterwards the abundance that was made bringing down the price of it " (DAVIES, 1666), other crops had to be grown. This other crop was sugar. In St. Christopher the English and French agreed in 1639 to cease planting for a year and in 1640-1642 the colonists turned entirely to the cultivation of sugar cane. Unfortunately, it was at once found, both in St. Christopher and Barbados, that white labourers were unsuited to raising sugar cane, and as a result the small holders were displaced, the work being done by negro slaves under the direction of a few white overseers. In 1667, JOHN SCOTT records that since 1643 no less than 12,000 good men had left Barbados for other plantations, while from 1645 to 1667 the owners of property changed from 11,200 small holders to 745 owners of large estates. Despite this exodus of small holders, however, there was a considerable number of new arrivals from England during the fifth decade. HARLOW (1926) states that as England became too hot for unrepentant royalists emigration to Barbados became the recognized course. Officers of the King's Army, if captured, preferred the option of going to Barbados to imprisonment in the Tower, and the same course was ruthlessly forced on the royalist rank and file to such an extent that the phrase 'to Barbados a man' became proverbial. These unfortunates were shipped over as indentured servants to a virtual slavery. The tide of immigration may be estimated by the fact that the white population of Barbados in 1645 was 18, to 20,000, and 5 years later, despite the epidemic of 1647-1649, had risen to over 30,000. At the same time the negro population increased by leaps and bounds. In 1640 there were but a few hundred negroes in Barbados, but as the cultivation of sugar cane increased so did the demand for negro slaves. In 1645, Sir GEORGE DOWNING wrote that the people of Barbados " have bought this year no less than a thousand negroes and the more they buie the more they are able to buye, for in a year and a halfe they will earne with God's blessing as much as they cost." In 1645 there were nearly 6,000 negro slaves in the island and five or six years later more than 20,000. The presence of these wild Africans caused some alarm, and to guard against sudden revolts most of the estate managers' houses were fortified and provided with large cisterns for the storage of water. As early as 1648 PETER FORCE reported many hundreds of escaped negro slaves in the woods. Most of these negroes came from the Gambia and Sierra Leone. An order from the directors of the English Guinea Corporation, ROWLAND WILSON and others, to one of their merchants, JAMES POPE, aboard the ship inappropriately named " Friendship," exhorts him (9th December, 1651) to exchange a cargo of spirits at the River Gambia for " as many lusty negroes or cattle as possible and send them to the Barbados " (Calendar of Duke of Portland's MSS.). The slaves were also transported in Dutch ships of from 100 to 200 tons to Barbados as well as to St. Christopher and Guadeloupe, where also the

Governor, the SIEUR DE HOULE, had introduced sugar planting in 1646. Between 1637 and 1642 the Dutch captured all the Portuguese posts on the African coast from Arguim in the far north down to St. Paul de Loanda, the capital of Angola, while from St. George d'Elmina, Cape Coast and Axim they dominated the Gold Coast against all other Europeans until about 1652 when the Portuguese regained many of their forts. Thus, during the fifth decade of the seventeenth century slaves were for the first time transported in large numbers in Dutch and English ships to the lesser Antilles. The passage from West Africa to Barbados was, however, much shorter than that to the mainland of America or to Santo Domingo, Cuba, and the other Spanish islands. The chances of transferring infected *Aëdes aegypti* from Africa to Barbados were thus much greater than when the slavers' voyages were far longer. In addition, there was a greater possibility, since all African natives are by no means immune to yellow fever, of a patient, black or white, contracting the disease on board ship and actually arriving in the West Indies while still in the infective stage. Unfortunately, no figures are available for the death rates in Dutch ships during the period under discussion. The Royal African Company's ledgers, however, give details of six English slave ships between 1670 and 1683. Of 1,653 slaves, 185 or 11·2 per cent., died on the voyage; sometimes the mortality was greater. "The Lady Francis in 1681 had not above 20 or 30 negroes liveing of abt 160 taken in at the Bite." (Letter from Royal African Company's factor at Barbados.)

It is probable that a similar state of affairs occurred in the Dutch ships during the years 1640-1649: at the same time the presence of a large non-immune population in the lesser Antilles and the provision of water cisterns would supply conditions suitable for the occurrence of an epidemic of yellow fever.

CONCLUSIONS.

The occurrence of an epidemic resembling yellow fever in Barbados, St. Christopher, Guadeloupe, Yucatan and Cuba in the years 1647-1649 is discussed. Evidence is brought forward in favour of the view that this infection was carried in ships from West Africa to Barbados or St. Christopher in the year 1647, economic and political conditions at this time favouring the transmission of either infected mosquitoes or persons in the infectious stage of yellow fever.

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